



processamento de imagem e visão

jorge s. marques, 2009

general information

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lessons: theory (3h/week) and lab (1.5h/week)

expected effort: 4h/week (3h for project + 1h of study)

doubts: send email 24h in advance

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syllabus

1. Introduction
2. Image enhancement
3. Restoration
4. Feature detection and matching
5. Segmentation
6. Motion analysis
7. Recognition
8. Surveillance
9. Structure from motion

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bibliography

Text books

- Richard Szeliski, Computer Vision: Algorithms and Applications, draft, 2009 (<http://research.microsoft.com/en-us/um/people/szeliski/Book/>)
- J. Marques, course notes and slides, 2006-2010.

Suggested reading

A list of papers is given in the course web page

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grading

grading: project (50%) + written exam (50%)

dates:

project: software delivery until 18 December.
report delivery until 4 January
project discussion until 6 de Janeiro

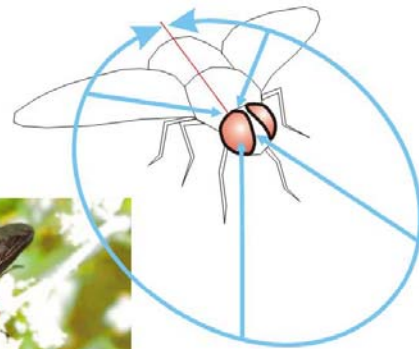
exams: 21 Janeiry
5 February

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why do we study computer vision?

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vision plays an important role in biological systems



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... and virtual ones



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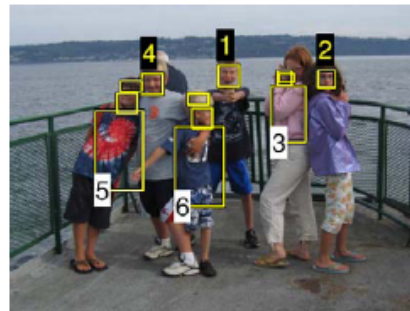
Applications



(a)



(b)



Szeliski book (draft), 2009

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automatic driving systems

Prof. Dickmanns developed vision systems for automatic driving of vehicles.

1995- the autonomous vehicle performed 1800 Km trip from Munique to Denmark in highways, with normal traffic conditions, achieving a velocity of 175 Km/h.

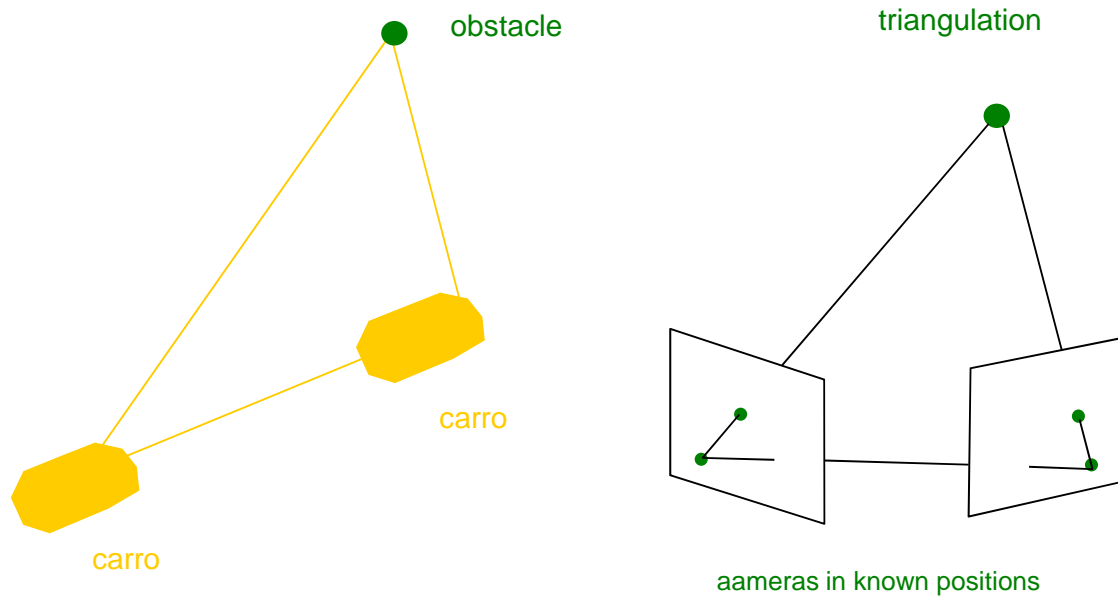


DARPA organizes anual competitions of autonomous vehicles in urban circuits.

<http://www.darpa.mil/grandchallenge>

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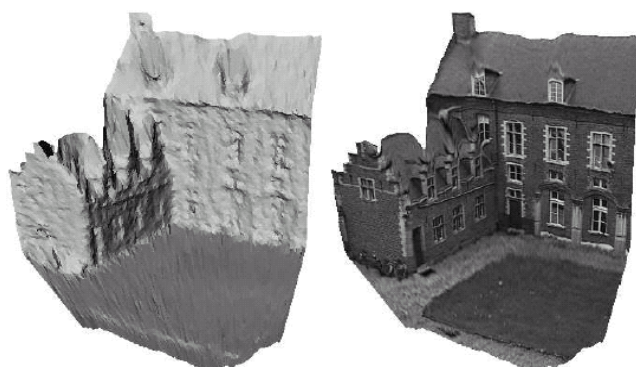
how to avoid obstacles?



(things are easier if the object lies in a plane – additional constraint)

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uncalibrated stereo



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(Pollefeys et al.)

traffic monitoring and road management



dangerous maneuvers



sign recognition

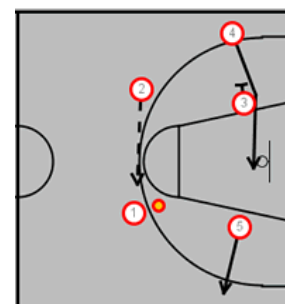
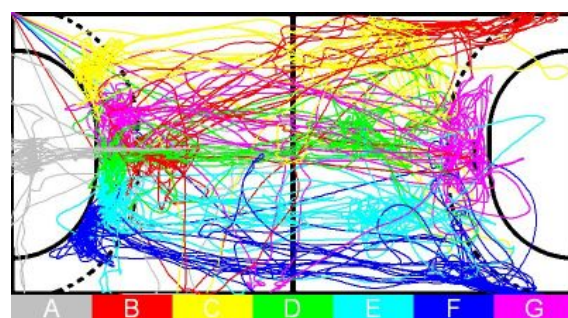


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analysis of sports



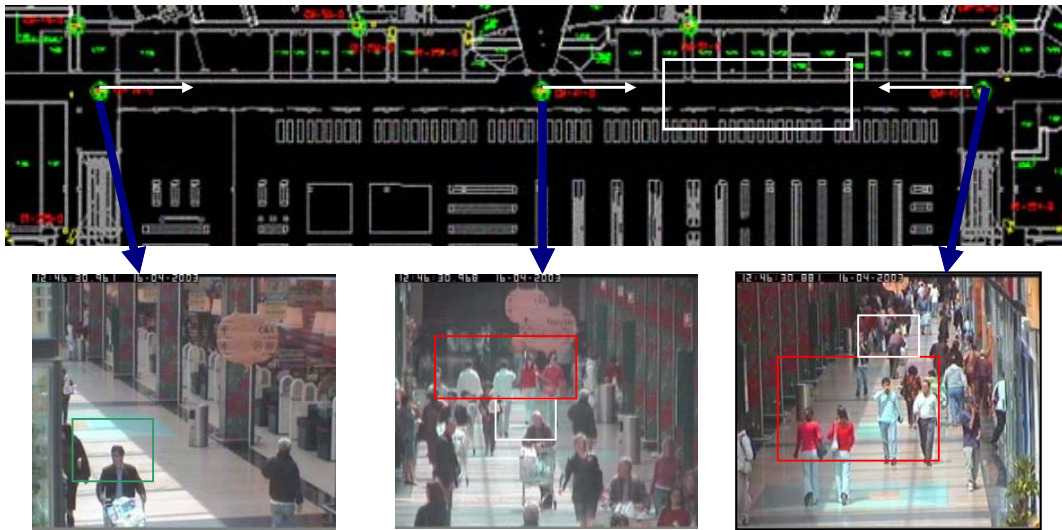
CETRINA1	08:33:22
[B] X= 7.71m Y= 6.85m U= 1.32m/s D= 666m	
[D] X= 7.57m Y= 9.34m U= 0.83m/s D= 638m	
[E] X= 6.34m Y= 13.09m U= 0.70m/s D= 717m	



<http://vision.fe.uni-lj.si/research/SportA/index.html>

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surveillance of public spaces

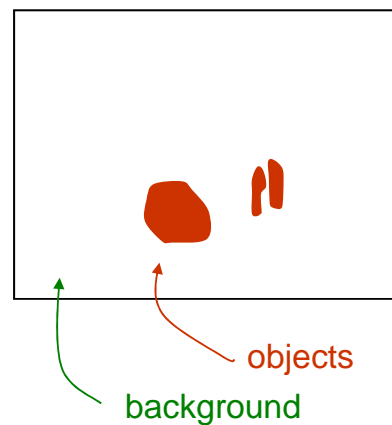


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how to detect moving objects?



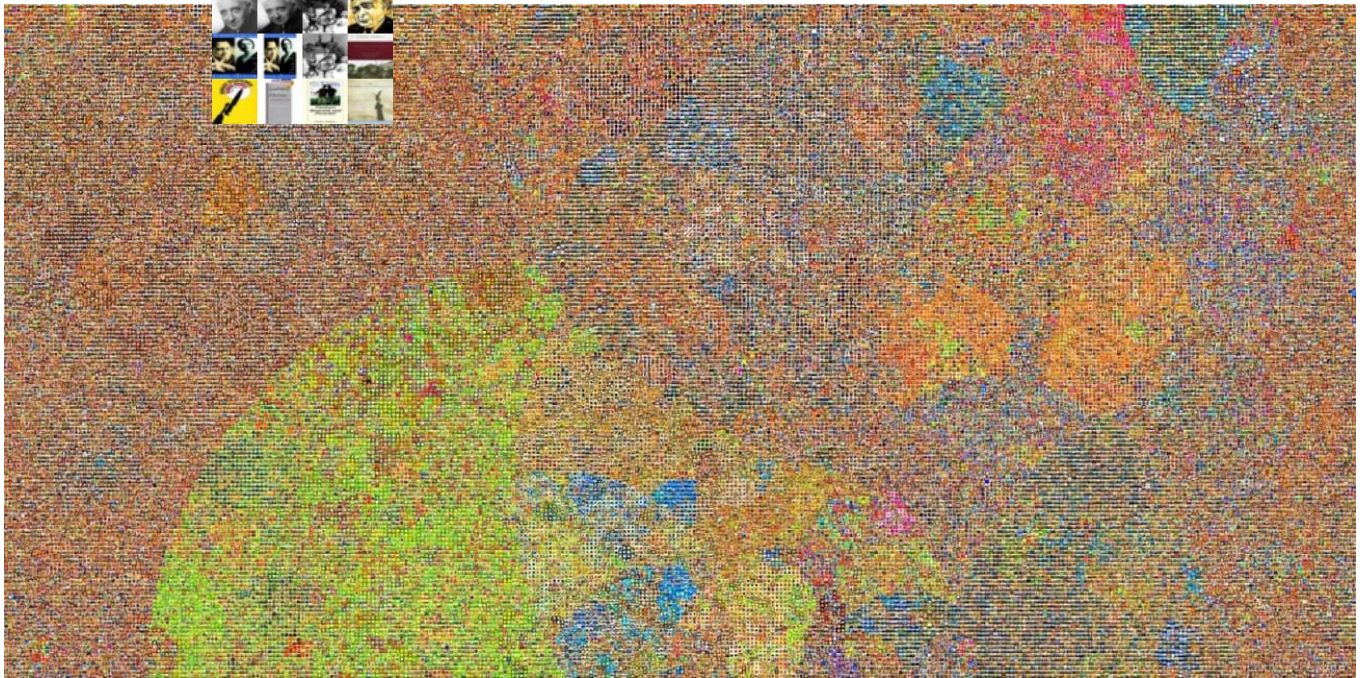
Imagem de fundo



compare each point of the observed image with the background image and detect differences

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80 million images (Torralba, MIT)

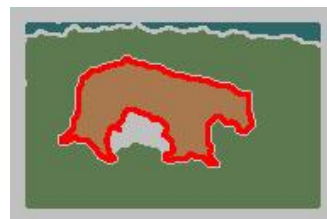


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<http://people.csail.mit.edu/torralba/tinyimages/>

how to search in databases?

query



answer

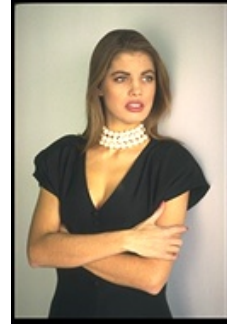


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<http://elible.cs.berkeley.edu/vision.html>

search procedure

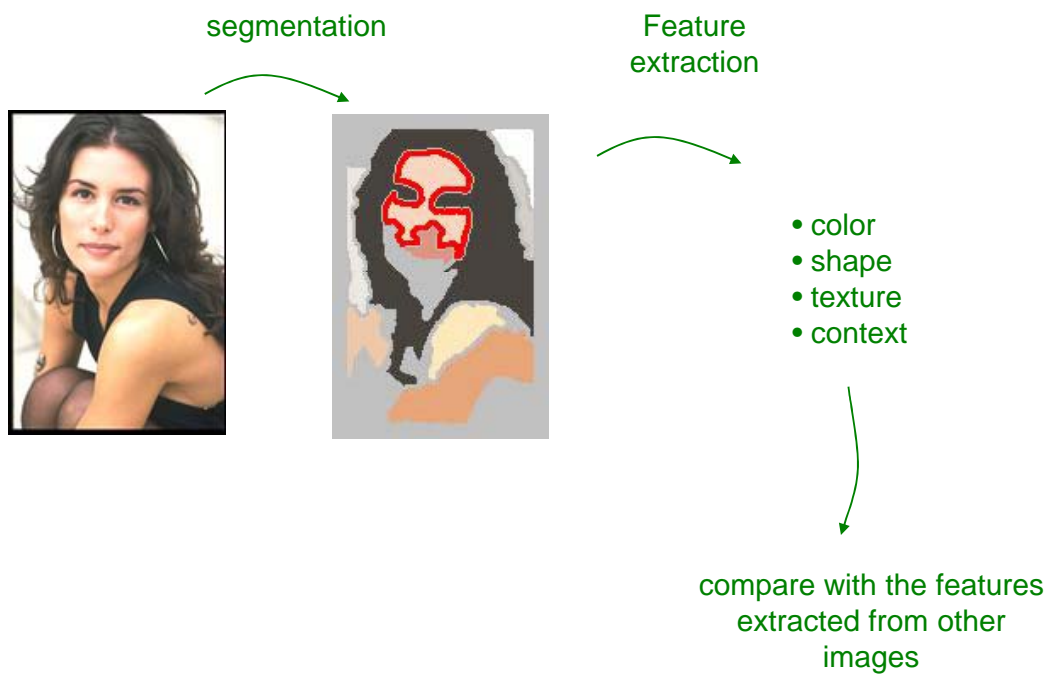
query



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<http://elab.cs.berkeley.edu/vision.html>

how to search?



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face detection



Bishop, 2004

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face detection



Bishop, 2004

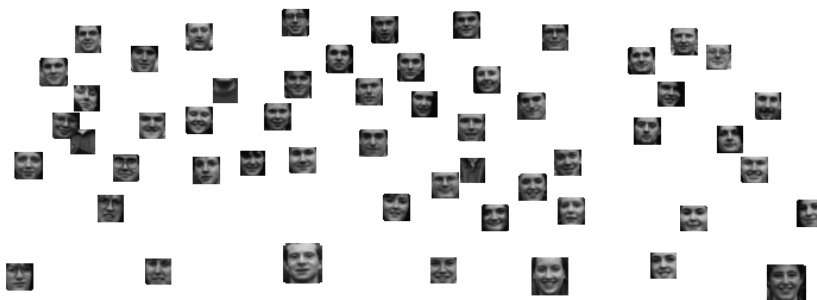
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face detection



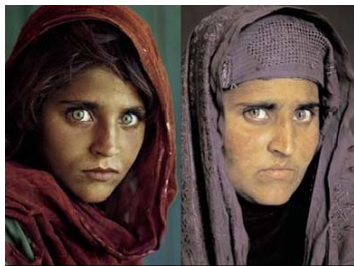
Bishop, 2004
jorge s. marques, 2009

face detection

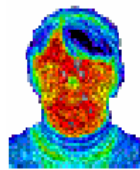


Bishop, 2004
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biometrics



iris



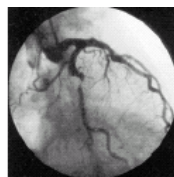
termic



Finger print



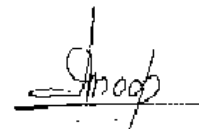
face



retina



hand



signature

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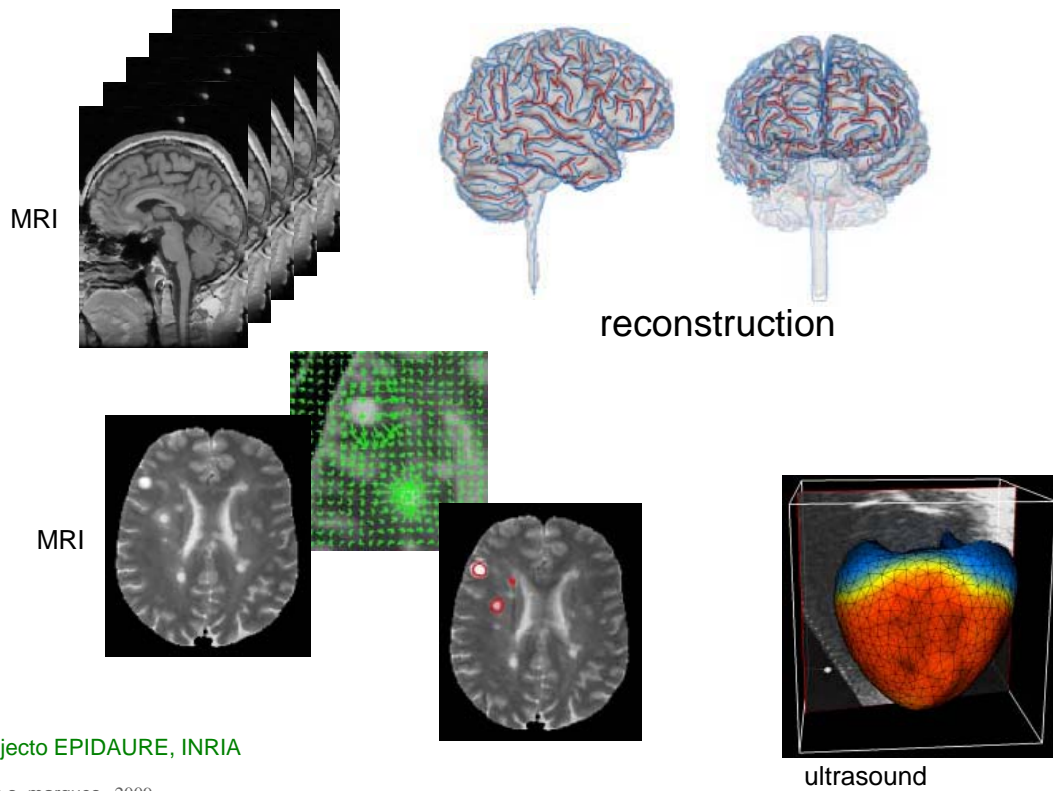
super-resolution



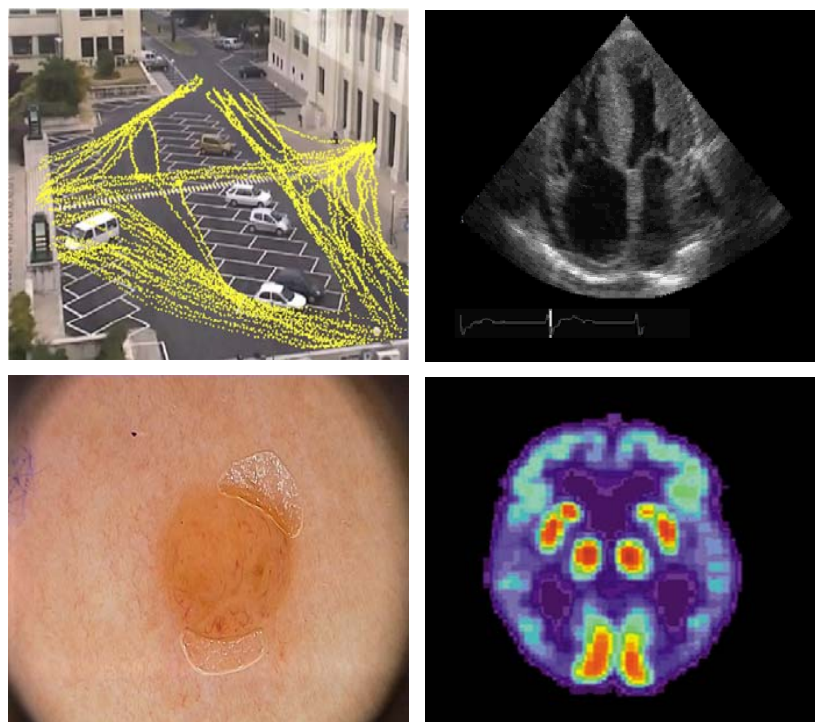
www.thedeemon.com/articles/what_is_super_resolution.html

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medical applications



my current projects

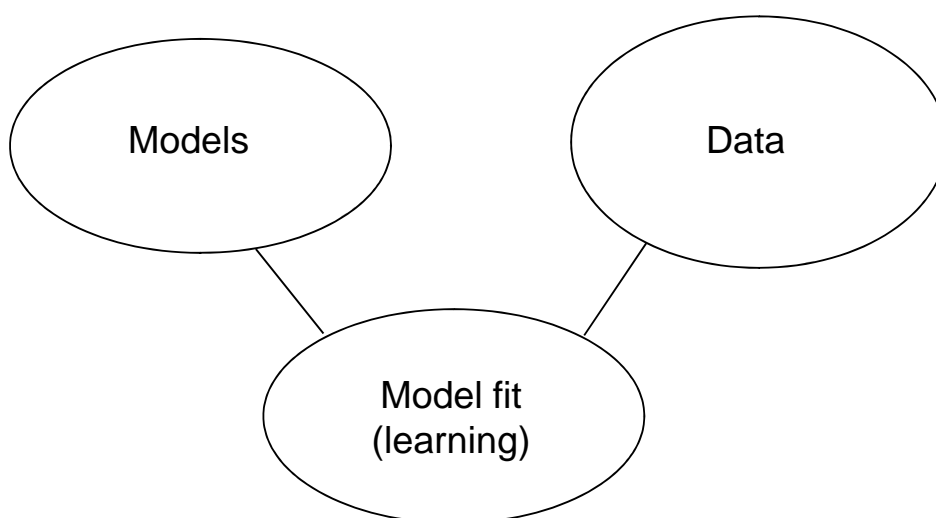


projects

- **ARGUS** – video surveillance (ISR, IT, INESC, supported by FCT)
- **Heart Tracking** – (ISR, supported by FCT)
- **ADDI** – analysis of dermoscopic images (FCUP, HPE, ISR, supported by FCT)
- **Detection of AD** – (ISR)

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what do these examples have in common?



its maths ... and lots of intuition

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